Black Gold Single Phase Uninterruptible Power Supply Systems
Guide Specifications
2.0kVA Industrial Rackmount

1.0 Scope

This specification describes the requirements for an On-Line Uninterruptible Power Supply (UPS). The UPS will supply a computer grade AC output sinewave which is unaffected by the quality of the AC input. The input voltage shall be single phase with the output voltage being single phase.

2.0 General Operation

Under normal operating conditions, the UPS's rectifier converts alternating current (AC power) to direct current (DC power), which is required for the system's inverter and battery charger. The charger supplies regulated DC power to keep the batteries constantly charged. The inverter uses pulse width modulation (PWM) that fully utilizes the characteristics of insulated-gate bipolar transistors (IGBT) to convert DC power to regulated AC power. Therefore there is a constant supply of power. The batteries will instantaneously supply the inverter DC power should an AC power line failure occur.

2.1 Performance Standards

The UPS shall be designed with the applicable sections of UL, CSA, NEMA PE-1, and IEEE-587(ANSI C62.41). The UPS shall have UL 1778 listing and is CUL certified..

3.0 General

3.1 Materials

All materials used are of new manufacture using the latest technology and should not have been in prior service except for specified factory testing. IGBT's (insulated-gate bipolar transistors) are used exclusively in inverter and chopper sections.

3.2 Components

All functioning components are solid state with no moving parts.

3.3 Installation

The installation of the UPS must comply with the UPS manufacturer's recommendations that will be supplied before delivery of the UPS. Local electrical codes and the National Electric Code must be complied with. All wiring must comply exactly with what is specified.

3.4 Assembly

The UPS shall be delivered fully assembled and be fully functional.

Line Cord:	5-20P
Receptacle Panel:	Six 5-15R (120V In / 120V Out)
	Six IEC 320 (230V in / 230V Out)

4.0 System Theory and Operation

4.1 Theory

AC input from the utility system is converted into DC power by a diode bridge rectifier and stepped up by the chopper. The stepped up DC power is then converted to AC power by the inverter. The output voltage waveform of the inverter will be the pulse voltage

waveform modulated by the PWM control using the 16 KHz switching frequency sinewave. The PWM-Modulated voltage waveform is transformed into a sine voltage waveform by the inductive component of the inverter transformer and by the capacitive component of the capacitor filter. The chopper, inverter, and charger use the IGBT with a self-extinguishing function and a high switching speed.

4.2 Modes of Operation

4.2.1 Emergency (Battery Backup)
In the event the AC power from the utility system fails, the DC power is supplied from the batteries to the chopper and to the inverter to provide a continued and stable AC power supply to the load without interruption.

4.2.2 Normal (Inverter)
The rectifier converts AC to DC to power the inverter, which supplies power to the critical load and simultaneously float charging the batteries.

4.2.3 Battery Charge
The charger will float charge the batteries while no load is being powered by normal mode.

4.2.4 Static Bypass
The load is being powered by an alternate source by being transferred from normal mode to bypass mode by the bypass switch. This mode is used during overload and maintenance repair. Power is conditioned by M.O.V.'s and a line filter during bypass operation.

5.0 UPS Input

5.1 System Rating The UPS's are sized to supply a load with a power factor of 0.70.

5.2 Electrical Requirements
Voltage: 120 VAC Single Phase +10%/-30%

Frequency: 50 or 60 Hz +/- 5 Hz

Input Harmonic Distortion: less than 10% THD (current)

Input capacity: 1.0 times output capacity

Input power: approximately 1.0 power factor (unity)

5.2.2 Battery Bus

Volts: 2.0 KVA 72 VDC nominal

Backup time: 6 mins @ full load/18 mins @ half load

Average Recharge: 24 hours (8 hours for 90%)

Type of Battery: sealed lead acid

Voltage Range: 2.0 KVA 57.6 – 82.8VDC

Cutoff Voltage: 1.60 VPC

6.0 UPS Output

Capacity: 2.0 KVA 1.40 KW

Voltage: 120 VAC Single phase

Regulation: +/-3% (with AC power and during battery backup)

Frequency: (50/60Hz)
Regulation: +/- 0.5% in free run mode
Synchronous range: +/- 1%

Rated Load Power Factor: 0.7 lagging

Crest Factor: 3

Transient Characteristics: +/- 5% for 100% load step change

Overload Capacity (Inverter): 150% For 60 seconds
1000% for 1 cycle

THD (Total Harmonic Distortion): 1% typical
3% maximum under linear load

Efficiency: 89%

Acoustical Noise: 45 dB(max), at 1 meter from front panel

Output Current:	RMS	PEAK
2.0 KVA	16.6A	50.0A

6.1 Bypass

If the UPS unit is overloaded or develops an internal fault, the power is automatically switched from the unit's main circuit to the bypass circuit mode. The UPS equipment load will be supplied by utility power through the bypass circuit. This changeover occurs in less than 4 milliseconds. The switching period is not long enough to cause interruptions to occur in your UPS equipment load.

There is also a switch on the front panel (Run/Stop) that allows you to manually switch from UPS to bypass mode. (Run - UPS mode, Stop - Bypass mode).

7.0 System Status and Control Indicators

7.1 Panel

The UPS has a panel on the front for complete monitoring of UPS.

Operation Panel:
1) Run/Stop
2) Fault indicator
3) AC Line indicator
4) Inverter indicator
5) 8 Segment LED Display

The eight segment LED display will indicate the following:

1) Output Load (normal operation)
2) Battery Voltage Level (during input AC failure)
3) Self-diagnostics (UPS faults)

Fatal Faults:
1) Input overcurrent
2) DC overcurrent
3) DC overvoltage
4) UPS system error

Non-Fatal Faults:
1) Output overvoltage
2) Output low voltage
3) DC undervoltage
4) Overheat
5) Battery problem

8.0 Dimensions

	2.0 KVA
Weight	119 lbs
Depth	24”
Width	16.75”
Height	5.25”

9.0 Communications

UPS comes with 4 dry contact signals relayed through a DB9 male connector.

1) AC input present
2) Low battery
3) Inverter
4) Bypass Active

All signals are (NO) in configuration with standard AS/400 interfaces.

UPS comes with a RS232 communication port for serial communication.

10.0 Reliability

Demonstrated mean time between failures (MTBF) of 200,000 hours.

11.0 Warranty

Every UPS comes with a "Security Plus" Warranty. This warranty provides on- site service for 3 years after shipment including parts and labor.

12.0 Options

12.1 Remote Monitoring

The UPS contains a communication slot this allows the operator to field install an optional RemotEye II card. The RemotEye II card shall allow the UPS to communicate via Ethernet SNMP, connected directly to the Local Area Network. SNMP/ Web based monitoring – Toshiba UPS system provides comprehensive monitoring of the UPS operation. The optional RemotEye II features an HTTP (web-based) interface for Toshiba UPS. This allows easy access to the Toshiba UPS information from any PC/Network with a web browser.

12.2 Environmental Monitoring Device (EMD)

The EMD is an environmental monitoring device that provides remote monitoring of temperature, humidity and other environmental conditions via standard web browser or network management systems. The EMD provides automated events notification when temperature, humidity or user defined dry contacts is out of configured tolerance.